Aeronautics Technology Theme

Update on FY 2004 Budget
to
Revolutionize Aviation Subcommittee
Aerospace Technology Advisory Committee

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Aeronautics Technology Division
Office of Aerospace Technology

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Theme Objectives

Protect Air Travelers and the Public

Decrease the aircraft fatal accident rate and the vulnerability of the air transportation system to threats and mitigate the consequences of accidents and hostile acts.

Protect the Environment

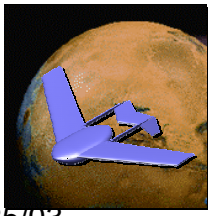
Protect local and global environmental quality by reducing aircraft noise and emissions.

Increase Mobility

Enable more people and goods to travel faster and farther, with fewer delays

Protect the Nation

Enhance the Nation's security through aeronautical partnerships with DOD and other government agencies.

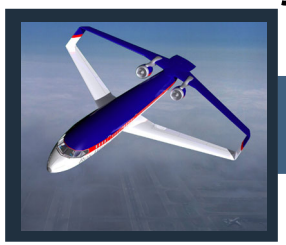


Explore Revolutionary Aeronautical Concepts

Pioneer novel aerospace concepts to support Earth and space science missions.

Aeronautics Technology

Theme Objectives

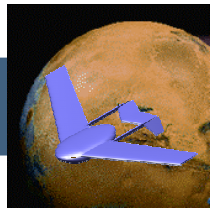


Protect Air Travelers and the Public

Protect the Environment

Increase Mobility

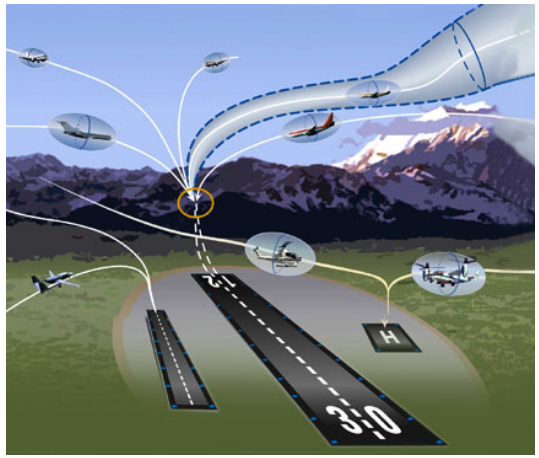
Protect the Nation



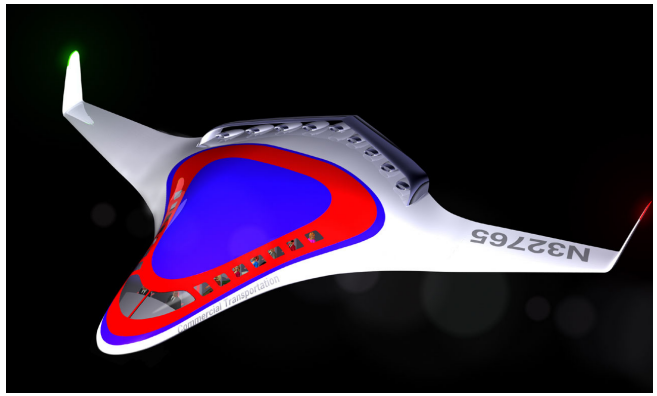
Explore New Aeronautical Missions

Programs

Aviation Safety & Security



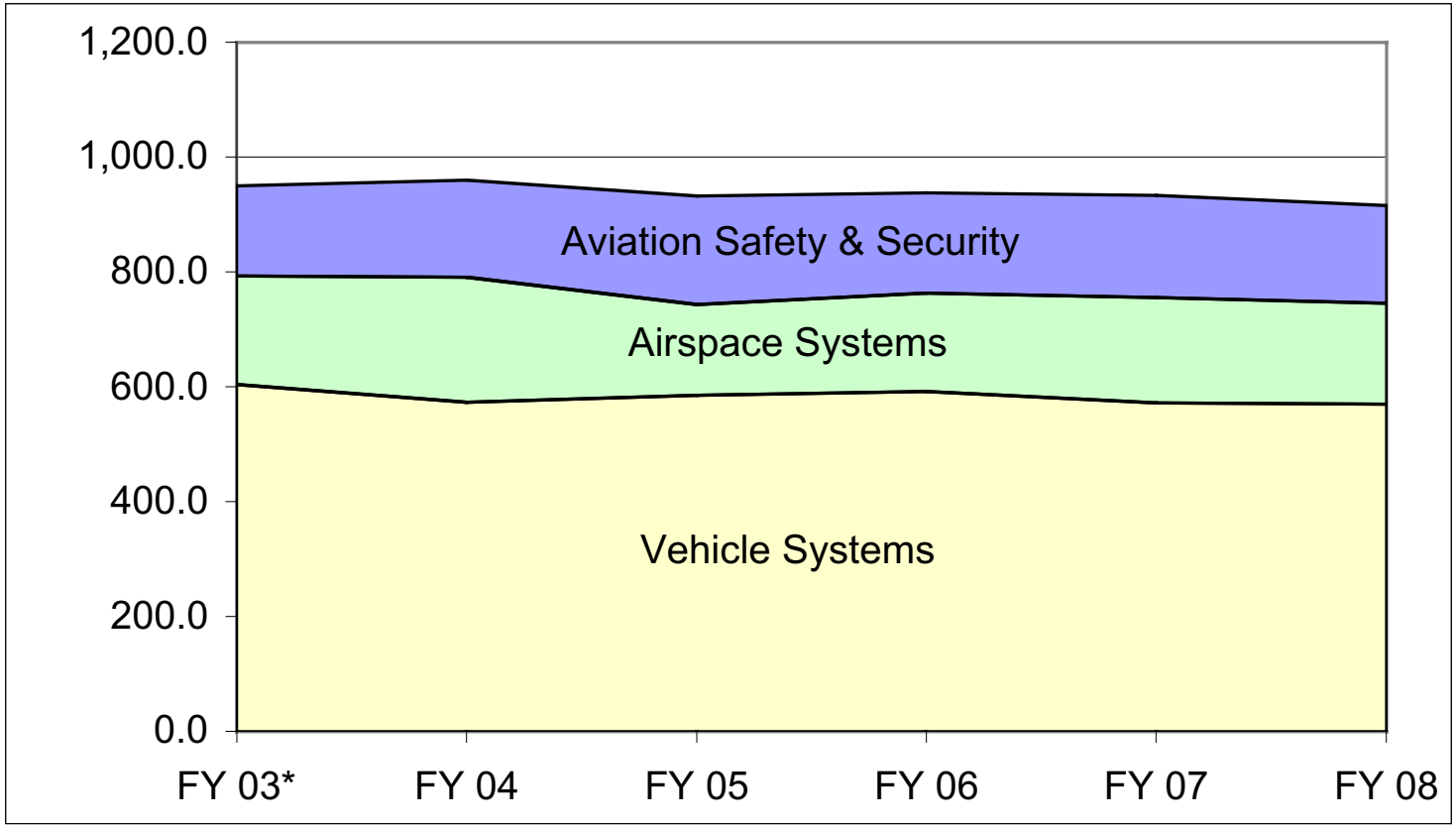
Airspace Systems



Vehicle Systems

Aeronautics Technology

Budget



	BAU	Full Cost					
	FY 03	FY 03*	FY 04	FY 05	FY 06	FY 07	FY 08
Aeronautics Technology	**541.4**	**949.2**	**959.1**	**932.2**	**938.7**	**933.8**	**916.4**
Aviation Safety & Security	95.0	156.2	168.5	188.4	175.2	178.2	170.9
Airspace Systems	125.1	188.4	217.1	158.0	172.1	183.9	176.0
Vehicle Systems	321.3	604.6	573.6	585.8	591.4	571.7	569.5

*FY 2003 reflects estimated Full Cost

Aeronautics Technology

FY 2004 President's Budget

($ Millions)	FY 03 BAU	FY 03*	FY 04	FY 05	FY 06	FY 07	FY 08
	541.4	949.2	959.1	932.2	938.7	933.8	916.4
Aviation Safety & Security	**95.0**	**156.2**	**168.5**	**188.4**	**175.2**	**178.2**	**170.9**
Vehicle Safety Technologies	49.8	83.9	74.5	81.5	-	-	-
System Safety Technologies	24.3	31.6	31.1	20.7	-	-	-
Weather Safety Technologies	20.9	40.7	42.3	42.5	-	-	-
Integrated Intelligent & Intuitive Safety Technologies & Sys	-	-	-		117.5	119.8	126.2
Aviation Security Technologies	-	-	20.6	43.7	57.7	58.4	44.7
Vehicle Systems	**321.3**	**604.6**	**573.5**	**585.8**	**591.4**	**571.7**	**569.5**
Quiet Aircraft Technology (QAT)	20.0	41.4	60.2	71.0	74.0	25.0	-
21st Century Aircraft Technology (TCAT)	29.0	46.0	42.0	42.5	42.1	-	-
Flight Research	58.9	91.4	85.4	43.3	10.5	-	-
ERAST	*[20.0]*						
Advanced Vehicle Concepts	34.7	72.5	41.0	49.7	-	-	-
Hyper-X	*[27.0]*						
Breakthrough Vehicle Technologies	61.9	124.2	115.3	115.9	143.1	-	-
Ultra-Efficient Engine Technology (UEET)	50.0	87.8	90.0	88.1	91.0	-	-
Propulsion & Power	66.8	141.3	139.6	125.1	31.0	-	-
Clean Adaptive Vehicle Systems	-	-	-	50.2	199.7	546.7	569.5
Airspace Systems	**125.1**	**188.4**	**217.1**	**158.0**	**172.1**	**183.9**	**176.0**
Advanced Air Transportation Technology (AATT)	71.6	103.5	105.6	-	-	-	-
Small Aircraft Transportation System (SATS)	20.0	29.2	30.6	9.9	-	-	-
Virtual Airspace Modeling & Simulation (VAMS)	23.0	35.3	33.3	33.0	35.0	34.0	-
Aviation Operations Systems	10.5	20.4	20.6	19.3	12.3	-	-
NASA Exploratory Technologies for the NAS (NExTNAS)	-	-	27.0	95.8	124.8	149.9	176.0

*FY 2003 reflects estimated Full Cost

Budget Definitions

Business as Usual vs. Full Cost

- Business as Usual (BAU) equates to direct R&D costs (including program support)
- Full Cost equates to BAU plus other costs previously budgeted under
  - Research & Program Management including civil service workforce and travel
  - Other institutional infrastructure costs such a Research Operations Support
- Full cost includes
  - direct procurements
  - direct civil service workforce, benefits, and travel
  - Service Pools
  - Center G&A
  - Corporate G&A

Aeronautics Technology

Major Changes FY 03 - FY 04

Aeronautics Technology	FY 03*	FY 04	Delta	Explanation
Total	**949**	**959**	**10**	
Aviation Safety & Security	156	168	12	• New Initiative for Aviation Security Augmentation (+21M) • Vehicle Safety Technologies (Synthetic Vision and Crashworthiness) (-9M)
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Aviation Safety and Security

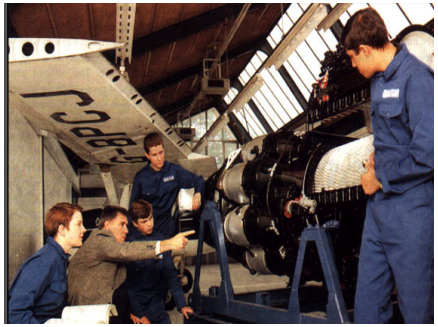
Vehicle Safety Technologies

- **Make every flight the equivalent of clear-day operations**
- **Self-healing designs and “refuse-to-crash” aircraft**
- **Increases survivability when accidents and aviation fires occur**

Weather Safety Technologies

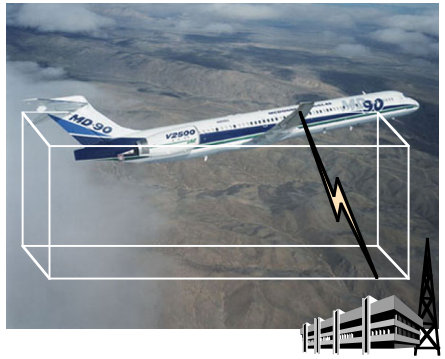
- **Brings intelligent weather decision-making to every cockpit**
- **Eliminate icing as an aviation hazard**

System Safety Technologies



- **Monitor and assess all data from every flight for known & unknown issues**
- **Improves human/machine integration in design, operations, & maintenance**
- **Applies aerospace technology to search and rescue needs**

Aviation Security



- **Secure and protect the aircraft**
- **Harden the National Airspace System**
- **Increase effectiveness of aviation info screening**
- **Integrate advanced sensors throughout the system**

Aviation Safety and Security

Major Changes FY 03 - FY 04

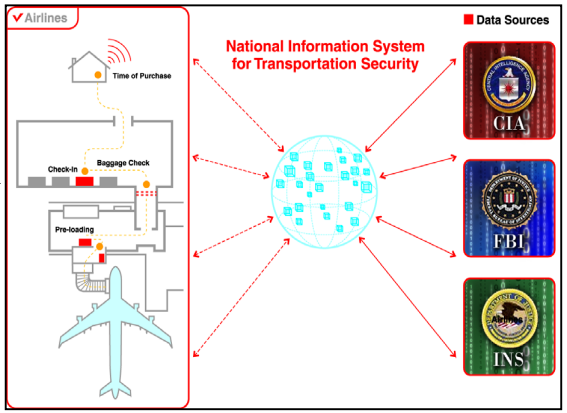
- Initiate Aviation Security in FY 2004 (+$21M)
- Adjustments to Aviation Safety activities
  - Synthetic vision (-$4.0M) progressing according to plan, however industry application faster than anticipated and so further technology maturity became unnecessary
  - Redirect relevant System-wide Accident Prevention (-$.5M) activities to Security focus
  - Reduced Crashworthiness (-$4.0M) activities based on program-wide priorities

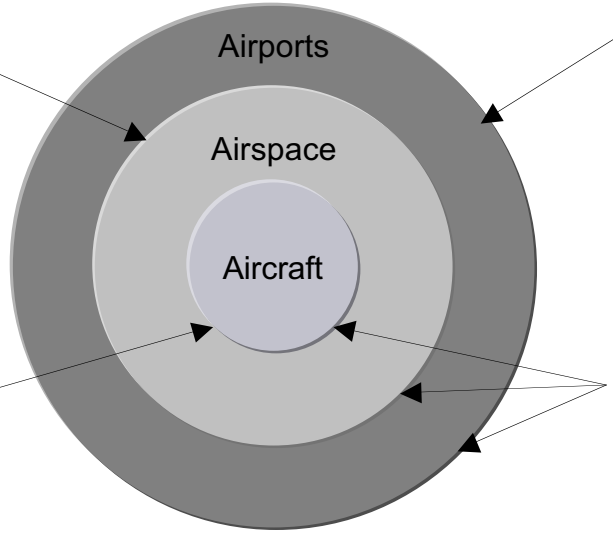
Aviation Security

Project Objectives

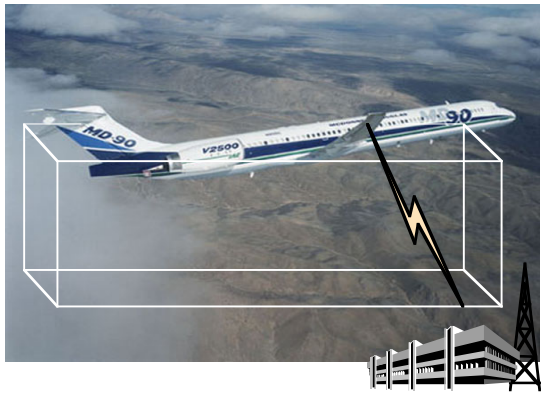
Airspace Operation Systems **– Harden the National Airspace System**

Information Screening **– Increase effectiveness of aviation information screening**

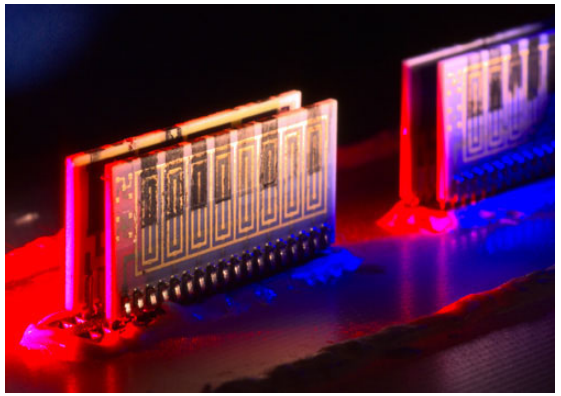




Aircraft & Systems Hardening **– Secure and protect the aircraft**



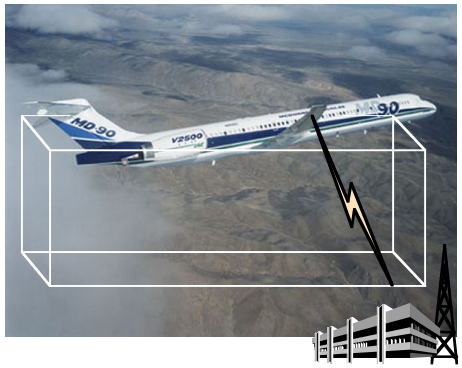
Sensors **– Integrate advanced sensors throughout the system**



Aviation Security

Technical Description

Aircraft & Systems Hardening

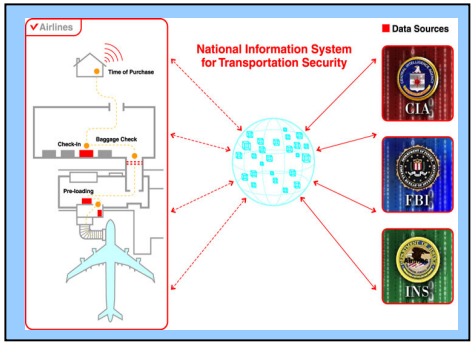


- **Light-weight hardening of structures/systems against explosive or electromagnetic threats**
- **Systems to enable safe landing of damaged aircraft**
- **Systems to ensure aircraft cannot be flown into terrain or buildings**

Airspace Operation Systems

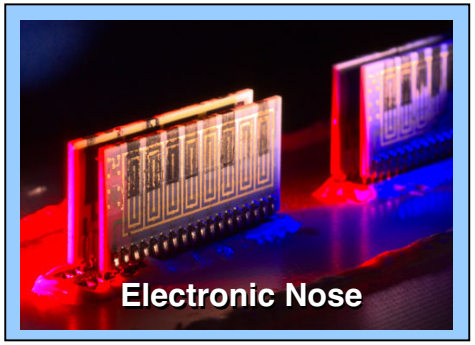
- **Air traffic control tools to detect rogue aircraft and provide emergency response data**

Information Screening



- **Real-time multi-database integration and fast, accurate data-mining tools**
- **Web-based system for collecting security problems from aviation system users**

Sensors



- **Small, fast, and accurate biological and explosive detection technologies for aviation applications**

Aviation Security Systems Analysis

Operational concept for secure, next-gen National Airspace

Threat identification and prioritization for aviation system

Aeronautics Technology

Major Changes FY 03 - FY 04

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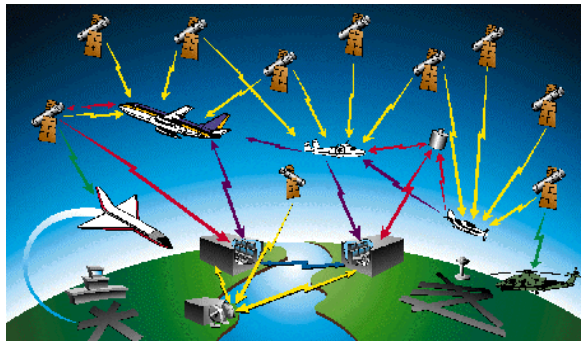
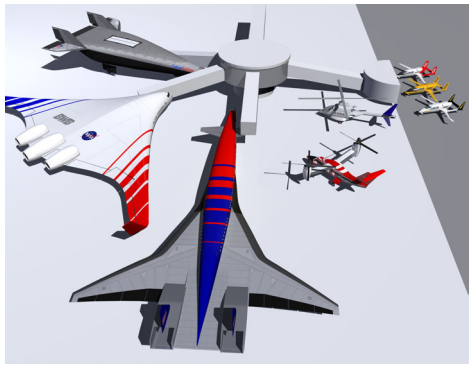
Airspace Systems Projects

AATT Project '96-'04



Improve gate-to-gate air traffic management to increase capacity & flexibility

NExTNAS Project '04-'08

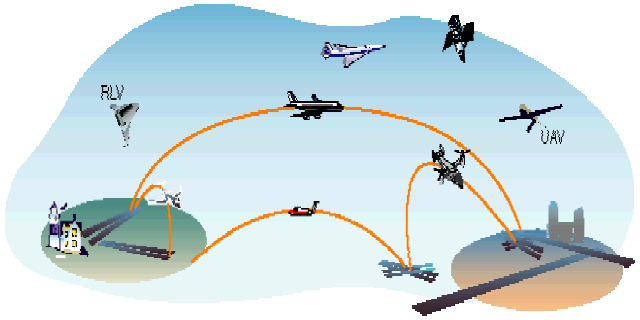


Technologies to enable future conops for a more flexible & efficient NAS

SATS Project '01-'05

Improve public mobility & community access with small aircraft/airports

VAMS Project '02-'06



Explore advanced concepts & model/simulate the NAS

AOS Project '00-'06

Understand & model human/systems

Airspace Systems

Major Changes FY 03 - FY 04

- Initiate NASA Exploratory Technologies for the National Airspace System (NExTNAS) in FY 2004 (+$27M)

FAA Interactions

Executive Committee

- NASA Administrator
- OGA Administrators
- FAA Administrator

Global Memorandum of Understanding (to be updated)

ATAC

FAA/NASA Executive Committee

- Jerry Creedon
- Charlie Keegan

JOINT PROGRAM OFFICE

REDAC

Aviation Safety Joint Working Group

- Terry Hertz
- Jim Jones

Interagency Integrated Product Team (AATT)

- Bob Jacobsen
- Greg Burke

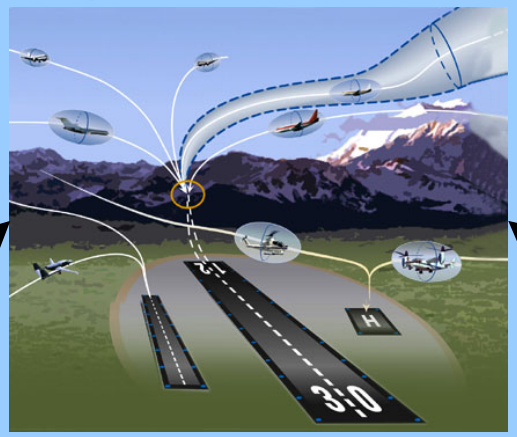
7 Memoranda of Understanding

24 Related Memoranda of Agreement

NASA Role

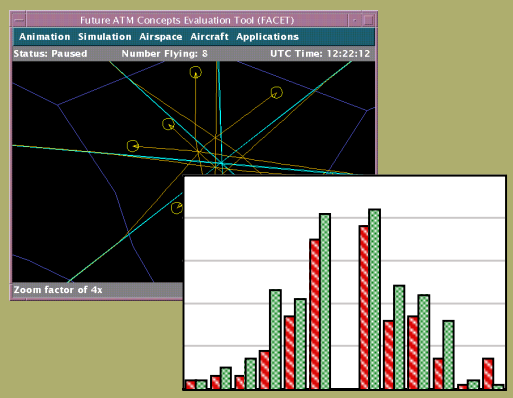
System-Level Concept
Development and Evaluation

VAMS



System Design
& Assessment

Technology Benefits
Assessments



Technology Requirements

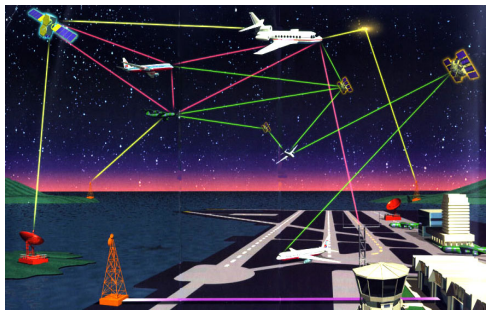
Tools for Airspace
Design and Assessment

System Technologies

NASA Exploratory Technologies for the NAS

Develop and Demonstrate exploratory technologies to enable a future airspace system capable of meeting growth in passenger demand beyond 2010

Space-Based Communications & Surveillance

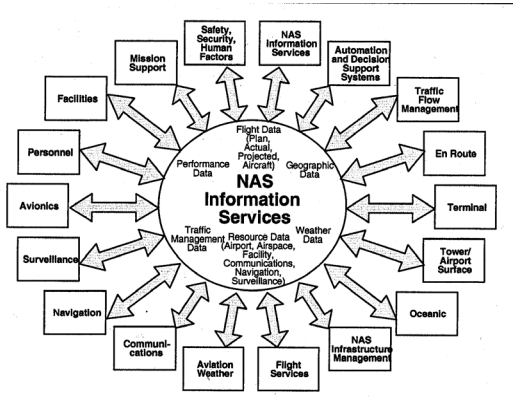


- Next generation CNS technologies
- CNS system interoperability

Wake Vortex Avoidance

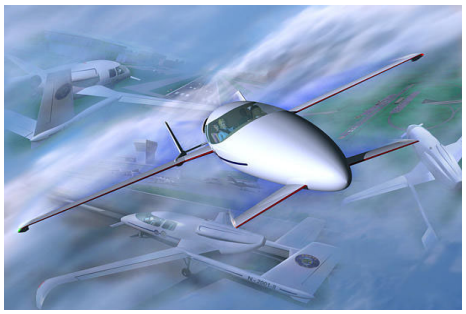
- WV-Sensitive Procedures Active Avoidance System

System-Wide Information Management



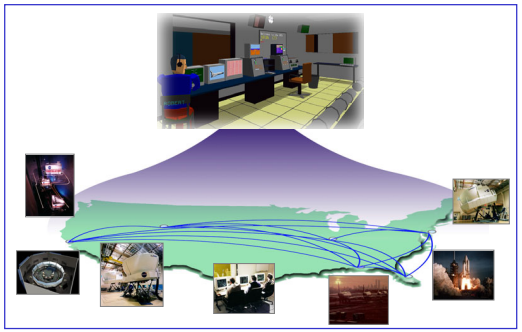
- Technologies to enable a single information network for data sharing among the users of the NAS

Dynamic Airborne Procedures



- Distributed air ground technologies
- Decision support tools

ATM Automation Technology from VAMS OpsCons



- NextNAS concept definition and evaluation

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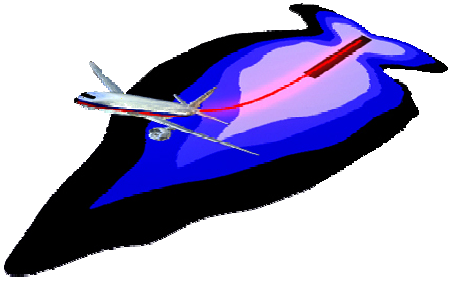
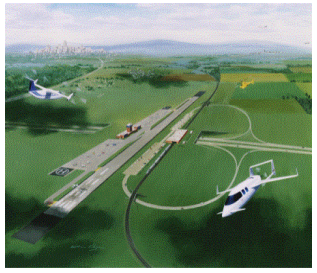
Vehicle Systems

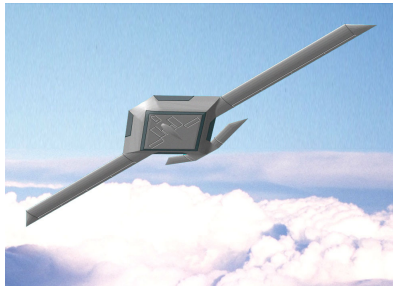


Environmentally Friendly Aircraft
Noise within Airport Boundaries
Smog Free
No Impact on Global Climate



Air Vehicles for Public Mobility
Anywhere
Anyone
Anytime

Superior Air Power
Technological Superiority
Partners in Freedom



New Aeronautical Missions
Science Platforms
Flight in Hazardous Environments

Vehicle Systems

Major Changes FY 03 - FY 04

- Augment Quiet Aircraft Technology project ($19M) to raise technical maturity to improve technology transfer
- Initiate Unmanned Aerial Vehicle in the National Airspace System ($8M) to enable more routine access (Flight Research subproject)
- Conclude ERAST (-$20M) and Hyper-X (-$27M)
- Terminate planned follow-on Advanced Vehicle Concepts subprojects (-$5M)
  - Configuration research to reduce sonic boom of supersonic air vehicles
  - Configuration research of blended wing body transports
- Breakthrough Vehicle Technologies (-$9M)
  - Terminate next generation flight deck and delay development of nanomaterials

Quiet Aircraft Technology

Augmented Project

2003 2004 2005 2006 2007

Airframe Noise Reduction

- Sub-scale, simplified airplane model in wind tunnel

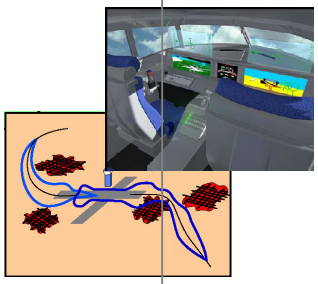
Quiet high-lift and landing gear concepts

Large scale airframe demonstration

Innovation configuration flight test

- Large-scale, realistic airplane model in wind tunnel

Low Noise Operations



- Computer simulation of low noise operations

Single event noise prediction

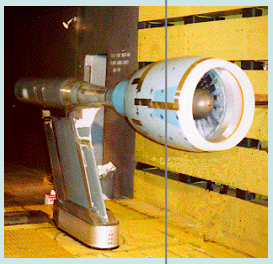
Field test integrated airborne/ATM system

Low noise take-off procedures

Real-time simulation low-noise ops

- Validation in high density, controlled airspace

Engine Noise Reduction



- 22” diameter engine simulator in wind tunnel

Large scale validation of 4 dB engine noise reduction

- Static, full-scale (real) engine test

Unmanned Aerial Vehicles (UAVs) in the NAS

UAV's provide sensing and communications platforms for dull, dirty and dangerous mission.

National Security

Homeland Security

Pipeline, Power-line, & critical infrastructure monitoring

Law Enforcement, Regulatory Agency Support

Low Cost Telecom Market

Commercial Imaging

Quality of Life

Real-time Disaster Management

Marine Fisheries Monitoring

Hurricane Reconnaissance

Search and Rescue

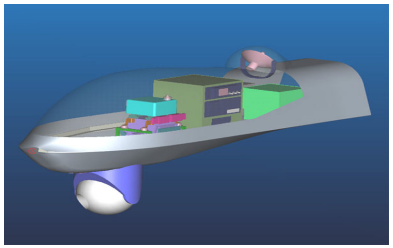
Fire/HAZMAT Monitoring

Earth Resources Mgmt

UAV in the NAS Objective: Develop and demonstrate technologies required for routine, safe, secure, and efficient high-altitude, long-endurance unmanned aerial vehicle operations in the National Airspace System

UAV in the NAS
Subprojects

Technology Development



Detect See & Avoid Systems

Over the Horizon Communication Systems

- Develop specific technologies identified in the systems analysis studies that enable project goals
- Develop air traffic control procedures and air traffic management decision support tools to facilitate unmanned aerial vehicles operations
- Develop ground control station display / command guidelines

Simulation and Demonstration

High Fidelity Simulations

Flight Demonstrations

- Validate specific technologies in simulation
- Establish traffic impact assessments through Monte-Carlo methods
- Demonstrate ability to operate safely in the National Airspace System utilizing technology and procedures developed

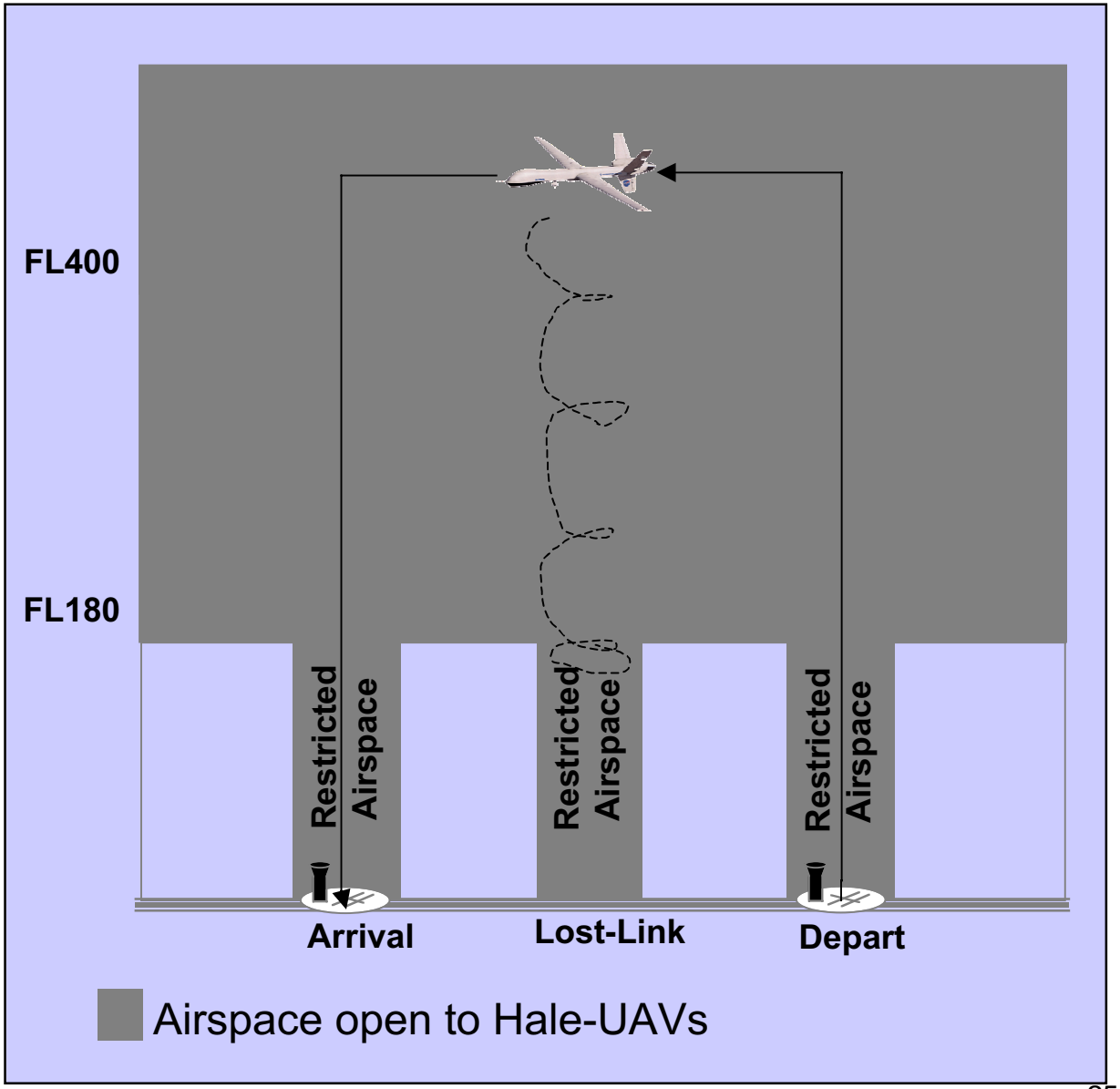
Unmanned Aerial Vehicles in the National Airspace System Initiative

Interim Milestone

Routine Operations above FL 400 FY ’06

Project Goal

Routine Operations above FL 180 by FY ’08



Unmanned Aerial Vehicles in the National Airspace System Initiative

Interim Milestone

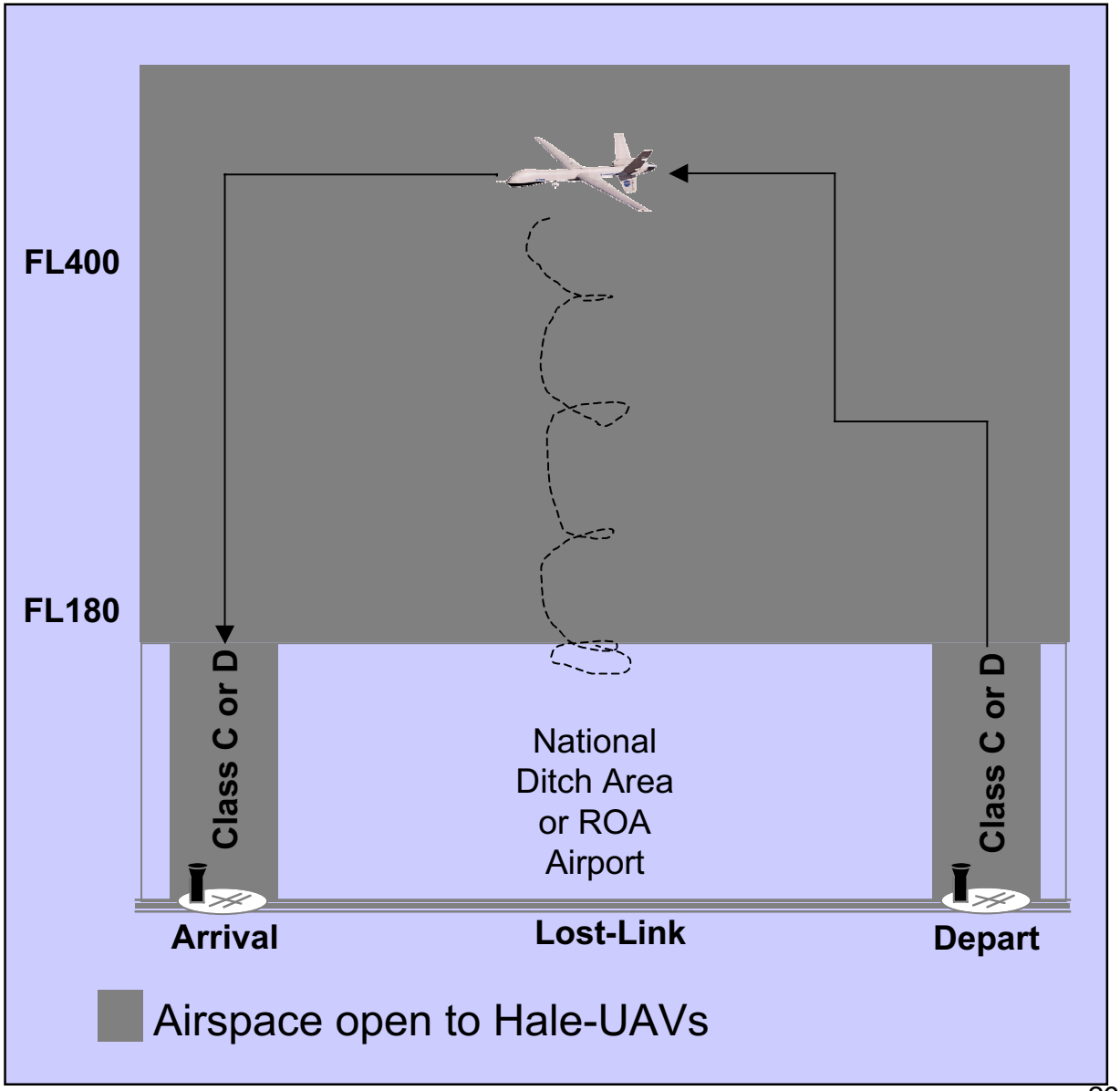
Routine Operations above FL 400 FY '06

Project Goal

Routine Operations above FL 180 by FY '08

Routine Access

Unrestricted flight from all airports



Aeronautics Technology
Summary

- Making satisfactory progress toward aeronautics goals
- Changes reflect changing environment
  - Aviation security
  - New missions for UAVs
  - Technologies for the airspace system after next
- Ensuring technology transfer

Aeronautics Technology

Opportunities

- Larson Bill (House Bill 586) / Allen Bill (Senate Bill 309)
  - Subsonic transports
  - Supersonic transports
  - Rotorcraft
  - Aviation Weather Research
  - Air Traffic Management
- Joint Program Office
- Expanded definition of public good with respect to mobility
  - Ticket price